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Application Number

10/663,945

Filing Date

09/16/2003

First Named Inventor

E. JOHN CUSTY

Art Unit

2629

Examiner Name

KEVIN M. NGUYEN

Attorney Docket Number

84037

ENCLOSURES (Check all that apply)

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<input type="checkbox"/> Fee Attached	<input type="checkbox"/> Licensing-related Papers	<input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences
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Printed name	J. ERIC ANDERSON		
Date	11/21/06	Reg. No.	58,706

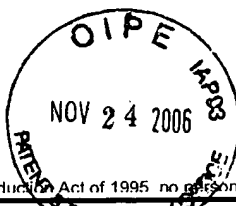
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FEE TRANSMITTAL

For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 500.00

Complete if Known

Application Number	10/663,945
Filing Date	09/16/2003
First Named Inventor	E. JOHN CUSTY
Examiner Name	KEVIN M. NGUYEN
Art Unit	2629
Attorney Docket No.	84037

METHOD OF PAYMENT (check all that apply)☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____☒ Deposit Account Deposit Account Number: 50-0847 Deposit Account Name: SPAWARSYSCEN San Diego

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☒ Charge fee(s) indicated below☐ Charge fee(s) indicated below, except for the filing fee☒ Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17☒ Credit any overpayments**WARNING:** Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**FEE CALCULATION****1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES**Fee Description**

Each claim over 20 (including Reissues)

Fee (\$)	Small Entity Fee (\$)
50	25

Each independent claim over 3 (including Reissues)

200	100
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Multiple dependent claims

360	180
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Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
- 20 or HP =	x	=	

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
- 3 or HP =	x	=	

HP = highest number of independent claims paid for, if greater than 3.

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
- 100 =	/ 50 =	(round up to a whole number) x	=	

4. OTHER FEE(S)

Non-English Specification, \$130 fee (no small entity discount)

Fees Paid (\$)

Other (e.g., late filing surcharge): Fee for Appeal Brief

500.00

SUBMITTED BY

Signature		Registration No. (Attorney/Agent) 58,706	Telephone 619-553-3822
Name (Print/Type)	J. ERIC ANDERSON	Date	11/21/06

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Vandy L. Lehman

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No: **10/663,945**

Examiner: **Kevin M. Nguyen**

Filing Date: **09/16/2003**

Appellant: **E. John Custy**

Art Unit: **2629**

Title: **APPARATUS AND METHOD FOR INCORPORATING TACTILE
CONTROL AND TACTILE FEEDBACK INTO A HUMAN-MACHINE
INTERFACE**

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21 November 2006

APPELLANT'S APPEAL BRIEF UNDER 37 C.F.R. §41

Sir/Madam:

This is an appeal from a Final Rejection by Kevin Nguyen of claims 1-14 and 16-18, which are set forth in a CLAIMS APPENDIX hereto, and which together comprise all remaining claims in the application. Appellant mailed a Notice of Appeal on October 31st, 2006.

11/27/2006 RMEBRAHT 00000020 500847 10663945

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REAL PARTY IN INTEREST

The United States Government, and E. John Custy are real parties in interest in this invention.

RELATED APPEALS AND INTERFERENCES

No related appeals and interferences are known to exist in the present case.

STATUS OF CLAIMS

Claims 1, 7, and 14 have been finally rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent number 6,703,924 to Tecu et al. (hereinafter *Tecu*) in view of U.S. patent number 7,009,595 to Roberts et al. (hereinafter *Roberts*). Claims 1-5, 7-14 and 16-18 have been finally rejected under 35 U.S.C. 102(e) as being anticipated by U.S. patent number 6,693,516 to Hayward (hereinafter *Hayward*). Claim 6 has been finally rejected under 35 U.S.C. 103(a) as being unpatentable over *Hayward* in view of U.S. patent number 6,354,839 to Schmidt et al. (hereinafter *Schmidt*). Claim 15 has been canceled. Claims 1-14 and 16-18 are currently on appeal.

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the Final Office Action mailed August 02, 2006.

SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 defines a tactile user interface device comprising: a substrate (page 4, ¶ 0011; Fig. 4); a plurality of tactile elements disposed on the substrate (page 4, ¶ 0011; Fig. 4); and a flexible membrane disposed on the plurality of tactile elements (page 6, ¶ 0014; Fig. 5). Each of the plurality of tactile elements corresponds to at least a fraction of a pixel on a video

display (page 5, ¶ 0012; Figs. 3A & 3B). Each of the plurality of tactile elements comprises: a pressure sensor, disposed to indicate if any of the tactile elements have been depressed (page 4, ¶ 0011; Fig. 2); and a feedback device, disposed to convey tactile feedback information (page 4-5, ¶ 0011; Fig. 2).

Independent claim 7 defines a tactile user interface device, comprising: a planar substrate (page 5, ¶ 0013; Fig. 4); a plurality of pins disposed on the planar substrate (page 5, ¶ 0013; Fig. 4); and a flexible membrane disposed on the plurality of pins (page 6, ¶ 0014; Fig. 5). Each of the pins corresponds to a pixel, a fraction of a pixel, or a group of pixels on a video display (page 5, ¶ 0012; Figs. 3A & 3B). Each of the pins comprises: a pressure sensor disposed to determine if any of the pins have been depressed (page 4, ¶ 0011; Fig. 2); and a feedback device disposed to convey tactile feedback information (page 4-5, ¶ 0011; Fig. 2).

Independent claim 14 defines a method for fabricating a tactile user interface device, comprising the steps of: fabricating a substrate (page 6, ¶ 0014; Fig. 5); disposing a plurality of tactile elements on the substrate (page 6, ¶ 0014; Fig. 5); disposing a flexible membrane on the tactile elements (page 6, ¶ 0014; Fig. 5); and disposing on the flexible membrane a plurality of microelectromechanical devices (page 6, ¶ 0014; Fig. 5), disposed to convey tactile feedback information (page 6, ¶ 0016; Fig. 6). Each of the microelectromechanical devices corresponds to one of the tactile elements (page 6, ¶ 0016; Fig. 6). Each of the tactile elements comprises a pressure sensor, disposed to determine if any of the tactile elements have been depressed (page 6, ¶ 0015; Fig. 6).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

I. Should the 35 U.S.C. §103(a) rejection of claims 1, 7, and 14, based on *Tecu* in view of

Roberts, be withdrawn when the references fail to teach or suggest all the claim limitations?

- II. Should the 35 U.S.C. §102(e) rejection of claims 1-5, 7-14, and 16-18, based on *Hayward*, be withdrawn when *Hayward* does not disclose each and every element of claims 1-5, 7-14, and 16-18?
- III. Should the 35 U.S.C. §103(a) rejection of claim 6, based on *Hayward* in view of *Schmidt*, be withdrawn when the base claim is unobvious and the cited references fail to teach or suggest all of the claim limitations?

ARGUMENT

- I. The 35 U.S.C. §103(a) rejection of claims 1, 7, and 14, based on *Tecu* in view of *Roberts*, should be withdrawn because *Tecu* in view of *Roberts* fails to teach or suggest all the claim limitations.**

*To establish prima facie obviousness of a claimed invention, **all** the claim limitations must be taught or suggested by the prior art.* (emphasis added) In re Royka, 490 F.2d 981, MPEP 2143.03

Claims 1 & 7

Appellant respectfully contends that the 35 U.S.C. §103(a) rejection of claims 1 and 7 is improper because the Examiner has failed to establish a *prima facie* case of obviousness. A *prima facie* case of obviousness has not been established because not all the claim limitations are taught or suggested by the prior art. Claims 1 and 7 call for a plurality of tactile elements/pins wherein each tactile element/pin comprises “a pressure sensor disposed to indicate if any of said

plurality of tactile elements have been depressed, and a feedback device disposed to convey tactile feedback information.” (Application Claims 1, 7) The Examiner maintains that the supplemental tactile display 42 of *Tecu* teaches the claimed feedback device. (Office Action page 3, ¶ 2) However, in the instant application a feedback device is integrated into each tactile element while *Tecu*’s supplemental tactile display is a separate device: it is not integrated into each of *Tecu*’s tactile output elements. (*Tecu* col. 4, lines 54-64) For example, in the embodiment where each tactile element is a moveable pin, such as is claimed in claim 7, each pin would have a corresponding pressure sensor and feedback device. In contrast, *Tecu*’s main display uses one set of pins to convey certain information, while the supplemental tactile display uses a different set of pins to convey other information. (*Tecu* col. 4, lines 54-64) Neither alone nor in combination do the cited references teach or suggest a plurality of tactile elements, each comprising a pressure sensor and a feedback device. Therefore, a *prima facie* case of obviousness has not been established.

Furthermore, claim 7 discloses “a plurality of pins disposed on said planar substrate wherein each of said plurality of pins correspond to a pixel, a fraction of a pixel, or a group of pixels on a video display.” (Application Claim 7) No mention of a fraction of a pixel is found in *Tecu*. *Tecu* teaches that “[e]ach of the plurality of output elements may correspond to a single pixel on the computer screen although, from a practical standpoint, it is preferable that each of the elements corresponds to a number of pixels grouped within a zone.” (*Tecu* col. 2, lines 40-44) A “single pixel” is not equivalent to a fraction of a pixel, and *Tecu* teaches away from having each element correspond to less than a pixel.

Additionally, there is no reasonable expectation that the combination of the flexible membrane of *Roberts* when combined with the device of *Tecu* would “achieve the benefit of

providing a new refreshable tactile graphics display technology, high-speed repetitive scan, the depiction of moving pictures, while fabricating the Braille display device at low cost” as claimed by the Examiner. (Office Action page 4) The addition of a membrane would only add to the cost of *Tecu*. It is unlikely that the addition of a flexible membrane to *Tecu* would somehow allow the *Tecu* device to depict moving pictures. High-speed, repetitive scan is a disclosed feature of *Roberts* that is due to the underlying mechanics and is not related to whether the device has a flexible membrane or not: simply adding a flexible membrane to *Tecu* will not result in high-speed, repetitive scan capabilities.

Claim 14

Appellant respectfully contends that the 35 U.S.C. §103(a) rejection of claim 14 is improper because the Examiner has failed to establish a *prima facie* case of obviousness by not showing that all the claim limitations are taught or suggested by the prior art. The Office Action merely recites: “The limitation of claim 14 is similar to those of claim 1, though in method form, therefore the rejection of claim 14 will be treated using the same rationale as claim 1.” (Office Action page 5, §5) However, claim 14 is not merely a recitation of claim 1 or 7 in method form. Claim 14 differs from claims 1 and 7 in that the flexible membrane is sandwiched between the tactile elements and a plurality of microelectromechanical (MEM) devices. Claim 14 discloses the step of “disposing on said flexible membrane a plurality of [MEM] devices disposed to convey tactile feedback information, wherein each of said [MEM] devices corresponds to one of said tactile elements.” (Application Claim 14) However, the Office Action ignores this further limitation and offers no indication of where the step of disposing MEM devices on a flexible membrane may be found or suggested in the prior art. Due to the absence of a showing of all the

claim limitations in the prior art, a *prima facie* case of obviousness has not been established regarding claim 14.

II. The 35 U.S.C. §102(e) rejection of claims 1-5, 7-14, and 16-18, based on *Hayward*, should be withdrawn because each and every element of claims 1-5, 7-14, and 16-18 are not expressly or inherently described in *Hayward*.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described in a single prior art reference.

Verdegaal Bros. V. Union Oil Co. of California, 814 F.2d 628; MPEP 2131

Claims 1-5 & 16-17

Appellant respectfully contends that the 35 U.S.C. §102(e) rejection of claims 1-5 & 16-17 is improper because each and every element of those claims is not described in *Hayward*. Claim 1 discloses in part a plurality of tactile elements covered by a flexible membrane wherein each tactile element comprises “a pressure sensor disposed to indicate if any of said plurality of tactile elements have been depressed, and a feedback device disposed to convey tactile feedback information.” (Application Claims 1) No description is provided in *Hayward* of a feedback device as part of each tactile element. In support of the 102 rejection of claim 1, the Office Action simply states: “The limitation of claims 1 and 7 are similar to those of claim 14, though in apparatus form, therefore the rejection of claims 1 and 7 will be treated using the same rationale as claim 14.” (Office Action page 6, §8) There are other differences between claims 1 and 14 that the Office Action does not mention. Claim 14 does not disclose a tactile element comprising

a feedback device, but rather discloses a MEM feedback device disposed on top of a flexible membrane that corresponds to a tactile element. The rejection of claim 14 is discussed below. Regarding the limitation of claim 1 of each tactile element comprising both a pressure sensor and a feedback device, nowhere in *Hayward* is such a limitation described. *Hayward* describes a contactor array 90 that comprises a pressure sensor 95, but no feedback device is described as being part of each contactor element. (See *Hayward* Fig. 5G. col.10, lines 15-24) Additionally, the limitation of claim 1 that the pressure sensors be “disposed to indicate if any of said plurality of tactile elements have been depressed” is not described in *Hayward*. The elements of *Hayward*’s contactor array 90 are not depressed, but laterally displaced to produce a skin-stretch sensation in a user’s finger. (See *Hayward* col. 5, lines 52-58; Fig. 3C) Even assuming, for the sake of argument, that each individual element of claim 1 was found in *Hayward*, the arrangement of each of the elements and their interaction with each other, as disclosed in claim 1, is not described in *Hayward* or any of the cited references.

Another limitation of claim 1 is that each tactile element corresponds to at least a fraction of a pixel on a video display. (Application Claim 1) This limitation is not found in *Hayward*, nor mentioned by the Office Action in its rejection. The current invention allows a user to move his/her hand over the tactile user interface device to distinguish various features on a corresponding video display. (Application page 7, line 3) In contrast, the device of *Hayward* operates using skin stretch, which requires the users hand to remain stationary. (*Hayward* col. 5, lines 20-29; Fig. 1) If each element of *Hayward*’s tactile display were to correspond to a different pixel on a video display the user would be required to lift his/her hand from the tactile display to feel other sections of the display; thus limiting the effectiveness of the skin stretch

technology. Accordingly, claim 1 and its dependents are not anticipated by *Hayward* and the 102 rejection should be withdrawn.

Claims 7-13

Appellant respectfully contends that the 35 U.S.C. §102(e) rejection of claims 7-13 is improper because each and every element of those claims is not described in *Hayward*. The arguments presented above regarding claims 1-5 & 16-17 apply to claims 7-13 as well. The limitation of claim 7 of a plurality of pins, each comprising a pressure sensor and a feedback device is not described in *Hayward*. In fact, *Hayward* distinguishes the operation of his device from others that utilize pins, or as he calls it, “indentation stimulation.” (*Hayward* col. 5, lines 14-17) Accordingly, claim 7 and its dependents are not anticipated by *Hayward* and the 102 rejection should be withdrawn.

Claims 14 & 18

Appellant respectfully contends that the 35 U.S.C. §102(e) rejection of claims 14 and 18 is improper because each and every element of those claims is not found in *Hayward*. For example, the step from claim 14 of “disposing on said flexible membrane a plurality of [MEM] devices disposed to convey tactile feedback information, wherein each of said [MEM] devices corresponds to one of said tactile elements” is not found expressly or inherently in *Hayward*. The Office Action maintains that *Hayward*’s actuators 70 and stumps 77 are equivalent to the MEM devices of the current invention. (Office Action page 6, §7) However, in the previous sentence of the Office Action, the Examiner described *Hayward*’s actuators 70 and stumps 77 as equivalent to the tactile elements of the current invention. The combination of actuators and

stumps of *Hayward* may not be both a MEM device and the tactile element to which it corresponds. *Hayward* does not describe a tactile element and a corresponding MEM device. Furthermore, the limitation that each MEM device be disposed on the flexible membrane is not found in *Hayward* nor mentioned in the Office Action. The only elements disposed on *Hayward's* membrane 76 are stumps 77 and tubular shafts 74. (See *Hayward* Fig. 5B) The combination of a stump and a tube by itself does not equal a MEM feedback device. Assuming the stump and tube equal a MEM device, there would then be no tactile element left in *Hayward* for the stump and tube to correspond to. Consequently, *Hayward* cannot be relied on as describing both: a MEM device, which corresponds to a tactile element, disposed on a flexible membrane; and a tactile element.

Claim 14 also discloses that each tactile element comprises a pressure sensor disposed to determine if any of the tactile elements have been depressed. (Application Claims 14) The Office Action suggests that a user's finger as mentioned in *Hayward* describes the pressure sensor of claim 14. (Office Action page 6, §7) Applicant respectfully contends that a user's finger is not equivalent to the pressure sensor of the current invention because a finger may not be incorporated into the tactile element. Also, as discussed above, *Hayward's* pressure sensors 95 are ill-suited to determine if any tactile elements have been depressed because the tactile elements of *Hayward's* contactor array 90 are not depressed as disclosed in the current invention, but laterally displaced to produce a skin-stretch sensation in a user's finger. (See *Hayward* col. 5, lines 52-58; Fig. 3C)

Contrary to what is stated in the Office Action, the limitation of claim 14 that each of the MEM devices corresponds to one of the tactile elements is not found in *Hayward*. The Office Action supports its position by partially quoting from col. 11, lines 63-66 of *Hayward*: "a

reversible transducer employs bi-directional tactile information is relayed to and from a user and a computer.” Applicant does not see how a description of *Hayward’s* device as a reversible transducer describes MEM devices corresponding to tactile elements. Applicant respectfully maintains that *Hayward* does not describe the limitation that each of the MEM devices corresponds to one of the tactile elements.

Hayward’s flexible membrane 76 is not equivalent to the flexible membrane of the current invention. The Office Action maintains that *Hayward* describes the step of “disposing a flexible membrane [76] on said plurality of tactile elements [70, 77].” (Office Action page 6, §7) However, *Hayward’s* membrane 76 is not disposed **on** tactile elements (i.e. stumps 77 supporting tubular shafts 74), but rather lies **under** them. (*Hayward* Fig. 5B; col. 9, lines 44-48)

Finally, the Office Action maintains that claim 18 is anticipated by *Hayward*. However, claim 18 is a dependent of claim 6. Claim 6 was not found to be anticipated by *Hayward* in the Office Action. A dependent claim cannot be found to be anticipated if its base claim is not. For these reasons and those stated above, Applicant respectfully contends that the rejection of claim 14 and 18 is improper and should be withdrawn.

III. The 35 U.S.C. §103(a) rejection of claim 6, based on *Hayward* in view of *Schmidt*, should be withdrawn because the base claim is unobvious and the cited references fail to teach all of the claimed limitations.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (emphasis added)

In re Royka, 490 F.2d 981, MPEP 2143.03

Appellant respectfully contends that the 35 U.S.C. §103(a) rejection of claim 6 is improper because the Examiner has failed to establish a *prima facie* case of obviousness. As shown above, *Hayward* fails to describe all of the claim limitations of claim 1. Applicant respectfully maintains that claim 6 is unobvious because claim 6 depends on claim 1, which has been shown to be unobvious. A proper dependent claim includes all the limitations of the claim from which it depends. Therefore, if claim 1 is unobvious then dependent claim 6, which adds a further limitation to claim 1, must also be unobvious.

There would be no motivation for one of ordinary skill in the art at the time the invention was made to combine *Hayward* with the MEM device of *Schmidt* because *Hayward* teaches away from such a combination. *Hayward* distinguishes his invention, which relies on “skin stretch” to convey information, from other tactile displays such as *Schmidt’s*, which use “skin indentation” to communicate information. (*Hayward* col. 2, lines 17-22)

Furthermore, there would be no reasonable expectation of success in the combination of the MEM device of *Schmidt* with *Hayward* because it would destroy the principle of operation of *Hayward*. As described above, *Hayward* relies on “skin stretch” to communicate information to a user. (*Hayward* col. 2, lines 19-22) *Schmidt’s* MEM device is for extending or retracting Braille dots. (*Schmidt* col. 7, lines 22-28) Such a device would cause the skin in contact with the Braille dot and the skin immediately surrounding the dot to disengage from the surface of *Hayward’s* tactile display and prevent communication via skin stretch. Due to the absence of all the claim limitations in the prior art, a motivation to combine, and a reasonable expectation of success, a *prima facie* case of obviousness has not been established regarding claim 6.

CONCLUSION

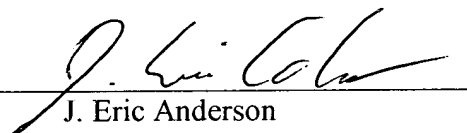
For the reasons expressed above, the claims on appeal are unobvious and unanticipated. Therefore, the respective rejections should be withdrawn and a notice of allowance issued for the appealed claims. The Commissioner is authorized to charge Deposit Account No. **50-0847** an amount of **\$500.00** to pay the fee for filing a brief in support of an appeal per 37 C.F.R. §1.17(c). Please charge any deficit or credit any excess to Deposit Account No. **50-0847**.

Respectfully submitted,

SPAWAR SYSTEMS CENTER SAN DIEGO

OFFICE OF PATENT COUNSEL 20012

By



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CLAIMS APPENDIX

Claims Involved in the Appeal

1. A tactile user interface device, comprising:

a substrate;

a plurality of tactile elements disposed on said substrate wherein each of said plurality of tactile elements correspond to at least a fraction of a pixel on a video display and wherein each of said plurality of tactile elements comprises:

a pressure sensor disposed to indicate if any of said plurality of tactile elements have been depressed; and

a feedback device disposed to convey tactile feedback information; and

a flexible membrane disposed on said plurality of tactile elements.

2. The tactile user interface device of claim 1 wherein each of said pressure sensors is disposed to provide an electrical signal when pressure from a user's finger exceeds a set pressure threshold.

3. The tactile user interface device of claim 2 wherein each of said pressure sensors is a mechanical switch.

4. The tactile user interface device of claim 2 wherein each of said pressure sensors is a piezoelectric sensor.

5. The tactile user interface device of claim 1 wherein said tactile feedback information includes elevations, vibrations, textures, and temperatures.

6. The tactile user interface device of claim 1 wherein each of said feedback devices comprises at least one microelectromechanical device, wherein said at least one microelectromechanical device has at least two mechanical states.

7. A tactile user interface device, comprising:

- a planar substrate;

- a plurality of pins disposed on said planar substrate wherein each of said plurality of pins correspond to a pixel, a fraction of a pixel, or a group of pixels on a video display and wherein each of said plurality of pins comprises:

 - a pressure sensor disposed to determine if any of said plurality of pins have been depressed; and

 - a feedback device disposed to convey tactile feedback information; and

- a flexible membrane disposed on said plurality of pins.

8. The tactile user interface device of claim 7 wherein each of said pressure sensors is disposed to provide an electrical signal when pressure from a user's finger exceeds a set pressure threshold.

9. The tactile user interface device of claim 8 wherein each of said pressure sensors is a mechanical switch.

10. The tactile user interface device of claim 8 wherein each of said pressure sensors is a piezoelectric sensor.

11. The tactile user interface device of claim 7 wherein each of said feedback devices is disposed to position said plurality of pins to a plurality of positions.

12. The tactile user interface device of claim 11 wherein each of said feedback devices is a piezoelectric device.

13. The tactile user interface device of claim 11 wherein each of said feedback devices is an electromagnet.

14. A method for fabricating a tactile user interface device, comprising the steps of:
fabricating a substrate;
disposing a plurality of tactile elements on said substrate wherein each of said tactile elements comprises a pressure sensor disposed to determine if any of said plurality of tactile elements have been depressed;
disposing a flexible membrane on said plurality of tactile elements; and
disposing on said flexible membrane a plurality of microelectromechanical devices disposed to convey tactile feedback information, wherein each of said microelectromechanical devices corresponds to one of said tactile elements.

16. The tactile user interface device of claim 1, wherein said substrate contains at least a portion of any control circuitry required for said tactile user interface device.

17. The tactile user interface device of claim 1, wherein said substrate contains any required control circuitry and any associated circuitry required for said tactile user interface device.

18. The tactile user interface device of claim 6, wherein each of said feedback devices is disposed on said flexible membrane.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.